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PESTS NOT KNOWN TO OCCUR IN THE UNITED STATES OR OF LIMITED
DISTRIBUTION, NO. 50: LIGHT-BROWN APPLE MOTH

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20782

Pest LIGHT-BROWN APPLE MOTH
 Epiphyas postvittana (Walker)

Selected Austrotortrix postvittana (Walker)
Synonyms Tortrix postvittana Walker

Order: Family Lepidoptera: Tortricidae

Economic The larva of Epiphyas postvittana is a serious pest of fruit
Importance and ornamentals in Australia and New Zealand. As a pest of pome
 fruits, particularly apples, it probably ranks second to Cydia
 pomonella (L.), codling moth. During a severe outbreak, damage
 by E. postvittana to fruit may be as much as 75 percent. In
 Tasmania, this species is the most injurious pest of apples. In
 years of abundance, populations of the light-brown apple moth
 may cause as much as 25 percent loss of the apple crop. This
 pest damages fruit in storage; a few larvae may ruin a whole
 case. The markings on the fruit render it unfit for export
 (Danthanarayana 1975, Evans 1937).

Hosts Larvae of light brown apple moth feed on a wide range of
 plants. Hosts include Acacia spp. (wattles), Actinidia
 chinensis (kiwi), Adiantum sp., Amaranthus hybridus (smooth
 pigweed), Amaranthus patulus (foxtail), Aquilegia sp., Arbutus
 sp., Arctotheca calendula (capeweed), Artemisia sp., Astartea
 sp., Aster subulatus (bushy starwort), Baccharis sp.
 (groundsel-bush), Boronia ledifolia (boronia), Brassica
 oleracea (wild cabbage), Breynia sp., Buddleia sp., Bursaria
 sp., Calendula officinalis (pot-marigold), Callistemon sp.,
 Camellia sp., Campsis sp., Cassia sp., Ceanothus sp.,
 Centranthus sp., Centranthus ruber (red valerian), Chamae-
 cyparis lawsoniana (Port-Orford-cedar), Chenopodium album
 (lambsquarters), Choisya sp., Chrysanthemum sp. (chrysanthem-
 um), Citrus sp., Clematis sp., Clerodendron sp., Correa
 speciosa, Cotoneaster sp., Crataegus sp., Cucurbita pepo
 (pumpkins), Cydonia sp., Dahlia sp., Datura sp., Daucus sp.,
 Dodonaea sp., Eriobotrya sp., Eriostemon sp., Escallonia sp.
 (escallonia), Eucalyptus sp., Euonymus sp., Euonymus japonica,
 Euphorbia sp., Feijoa sp., Forsythia sp., Fragaria sp. (straw-
 berry), Fortunella sp., Gelsemium sp., Genista sp., Gerbera
 sp., Grevillea robusta (silk-oak), Hardenbergia sp., Hebe sp.,
 Hedera sp. (ivy), Helichrysum sp., Humulus lupulus (hops),
 Hypericum sp. (St. John's wort), Jasminum sp. (jasmine),
 Juglans regia (English walnut), Lathyrus sp., Lavandula sp.
 (lavender), Leptospermum sp., Leucodendron sp., Ligustrum sp.

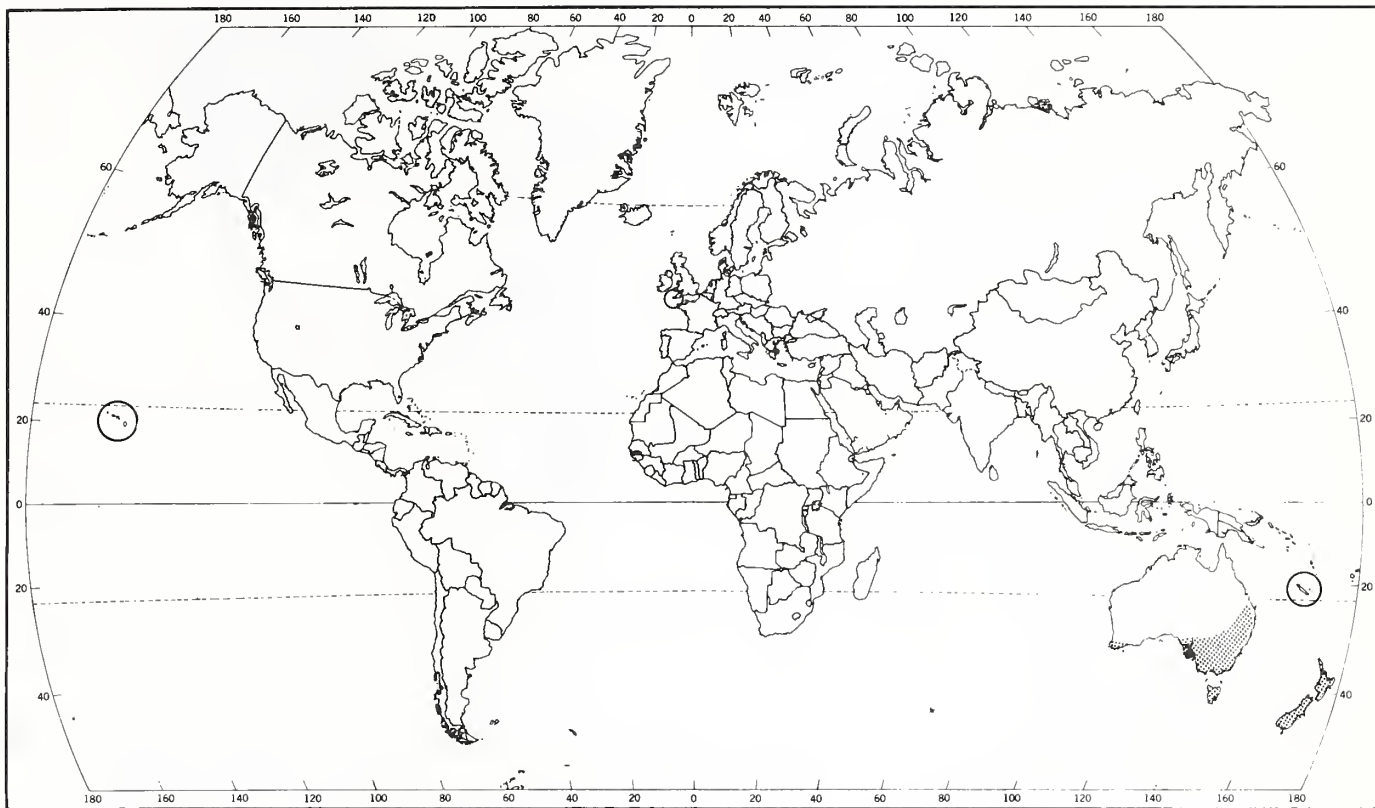
(privet), Ligustrum ovalifolium (California privet), Linum sp., Litchi sp., Lonicera sp., Lupinus sp. (lupine), Lycopersicon esculentum (tomato), Macadamia sp., Malus sylvestris (apple), Mangifera sp., Medicago polymorpha, Medicago sativa (alfalfa), Melaleuca sp., Mentha sp. (mint), Mesembryanthemum sp. (fig-marigold), Michelia sp., Monotoca sp., Myoporum sp., Oxalis sp., Parthenocissus sp., Pelargonium sp., Persoonia lanceolata (bonewood), Petroselinum sp., Philadelphus sp., Photinia sp., Phyllanthus sp., Pinus sp. (pine), Pinus patula (Mexican yellow pine), Pinus radiata (Monterey pine), Pipturus sp., Pittosporum sp., Plantago lanceolata (buckbean), Platysace sp., Polygala sp., Polygonum sp. (knotweed), Prunus armeniaca (apricot), Prunus avium (sweet cherry), Prunus domestica (plum), Prunus persica (nectarine, peach), Pteris sp., Pulcaria sp. (fleabane), Pulcaria dysenterica (fleabane), Pyracantha sp., Pyrus communis (pear), Quercus sp. (oak), Ranunculus sp., Raphanus raphanistrum (wild radish), Reseda odorata (mignonette), Ribes spp. (currants), Ribes uva-crispa (European gooseberry), Rosa sp. (rose), Rubus fruticosus (European blackberry), Rubus hawaiiensis, Rumex acetosella (sorrel), Rumex crispus (curly dock), Salvia sp., Santalum sp., Senecio sp. (groundsel), Sida sp., Sisymbrium officinale (hedge mustard), Smilax sp., Solanum tuberosum (potato), Sollya sp., Tithonia sp., Trema sp., Trifolium glomeratum (cluster clover), Trifolium repens (white clover), Trifolium subterraneum (subterranean clover), Triglochin sp., Ulex europaeus (gorse), Urtica dioica (nettle), Vaccinium sp., Viburnum sp., Vicia faba (broadbean), Vicia hirsuta (tiny vetch), Vicia sativa (vetch), Vinca sp., Vitis sp. (grape), Wikstroemia foetida, Wilkesia sp., and Wisteria sp. (Danthanarayana 1975 and 1983, Ferro 1976, Geier and Briesse 1981, Zimmerman 1978).

General Distribution

This species is indigenous to Australia (Queensland, New South Wales, Victoria, South Australia, and Tasmania) and has been introduced into Hawaii, New Caledonia, New Zealand, and southwestern England (Commonwealth Institute of Entomology 1957, Geier and Briesse 1981). It has also been introduced into southwestern Western Australia (D. Briesse, personal communication 1984).

Characters

ADULTS (Fig. 1) - Male smaller than female, length 5-10 mm, wingspan 12-24 mm. Wing venation in Fig. 2. Distinguished by forewing abruptly divided medially into pale basal and darker apical areas; female length 5-12 mm and wingspan 12-27 mm, forewings less marked than male's (Danthanarayana 1975, Zimmerman 1978).

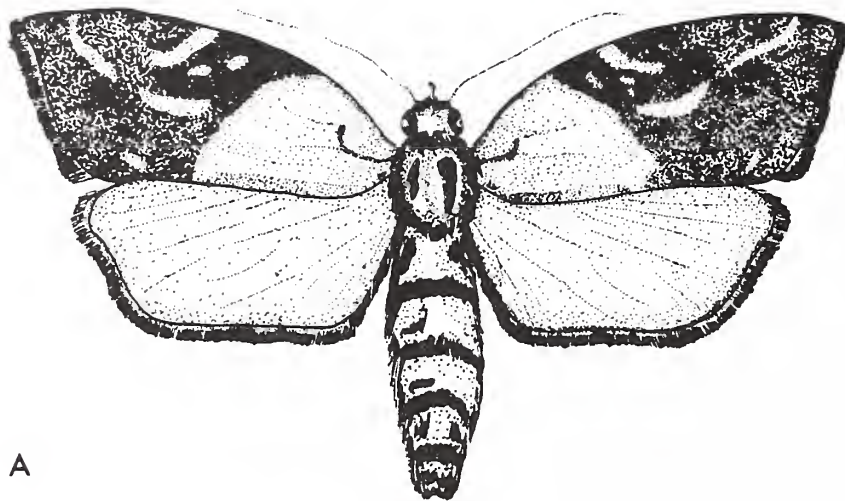


Epiphyas postvittana distribution map prepared by Non-Regional Administrative Operations Office and Biological Assessment Support Staff, PPQ, APHIS, USDA

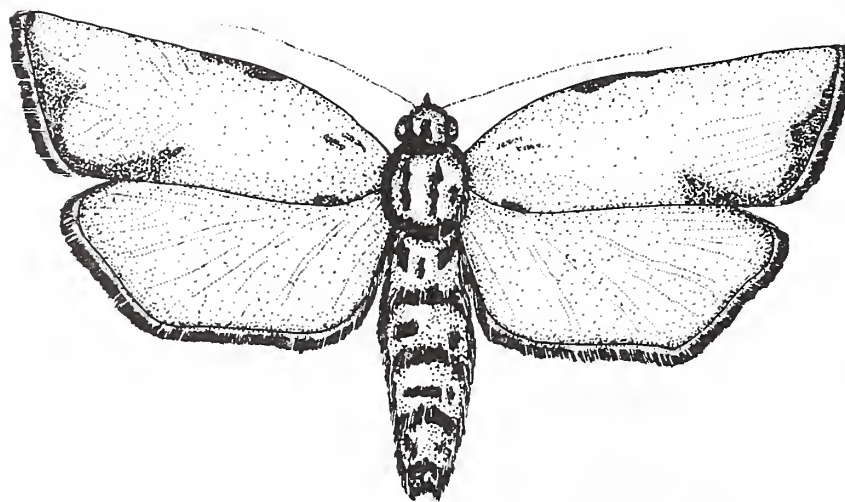
Male. Antenna weakly dentate ciliate, length of cilia about equal to width of flagellum. Forewing: basal half light buff or pale yellow; distal half dark brown, ferruginous; oblique narrow median fascia darker, inner edge sharply defined, straight, sometimes slightly sinuate at middle; pre-apical spot obscure, its inner margin usually defined by ferruginous ground color separating it from median fascia; well-developed costal fold from base to about two-fifths (Bradley, Tremewan, and Smith 1973), distinct V-shaped boundary when folded (Fig. 3) (Danthanarayana 1975). Hindwing gray (Bradley, Tremewan, and Smith 1973).

Male extremely variable with numerous recurring forms. In strongly marked forms, distal half of forewing reddish brown to blackish with purplish mottling; pale basal half may be sparsely black speckled. Lightly marked forms resemble female; extreme form with outer half of forewing light and pre-apical spot distinct (Bradley, Tremewan, and Smith 1973).

(Fig. 1)



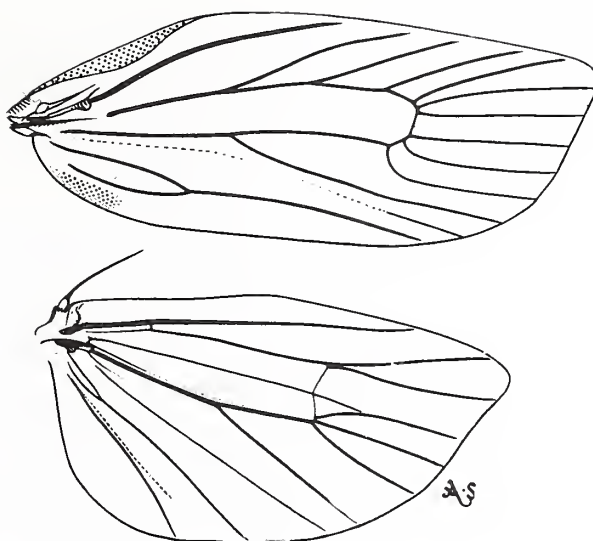
A



B

Epiphyas postvittana adults, dorsal view: A. Male. B. female
(From Ferro 1976).

(Fig. 2)



Wing venation of Epiphyas postvittana male, dorsal view
(From Zimmerman 1978).

(Fig. 3)



Epiphyas postvittana adults, dorsal view: Female (left); male
(right) (From Geier and Briesse 1981).

Male genitalia (Fig. 4A). Internal sac of aedeagus bears two to four long, narrow, flattened cornuti (Fig. 4B). These are deciduous and may be missing from mated specimens, but points of articulation can still be seen (Zimmerman 1978).

(Fig. 4)



Epiphyas postvittana: A. Male genitalia, dorsal view.
B. Three long, rodlike cornuti, dorsal view (From Zimmerman 1978).

Female. Antenna minutely ciliate. Forewing longer than male's, apex produced, contrast between basal and distal halves less than in male, median fascia usually reduced. Variation minor, forewing irrorate with black (Bradley, Tremewan, and Smith 1973). Female genitalia (Fig. 5).

Epiphyas postvittana may be confused with Amorbia emigratella Busck (Mexican leafroller), but E. postvittana has ocelli which are lacking in A. emigratella, the undersides of the hindwings are conspicuously immaculate as in A. emigratella and the second abdominal tergite lacks the conspicuous median pit near the base which is present in A. emigratella (Zimmerman 1978).

EGGS - Pale green to pale brown, almost flat (U.S. Department of Agriculture 1957), 0.84 by 0.95 mm (Danthanarayana 1975).

(Fig. 5)



Epiphyas postvittana: Female genitalia, holotype (British Museum slide 1815) (From Zimmerman 1978).

LARVAE (Fig. 6) - First instar pale yellow, head dark brown. Later instar head and prothoracic plate pale brown. Length of full-grown larvae 10-18 mm, body medium green, darker central stripe, two side stripes (Ferro 1976).

(Fig. 6)

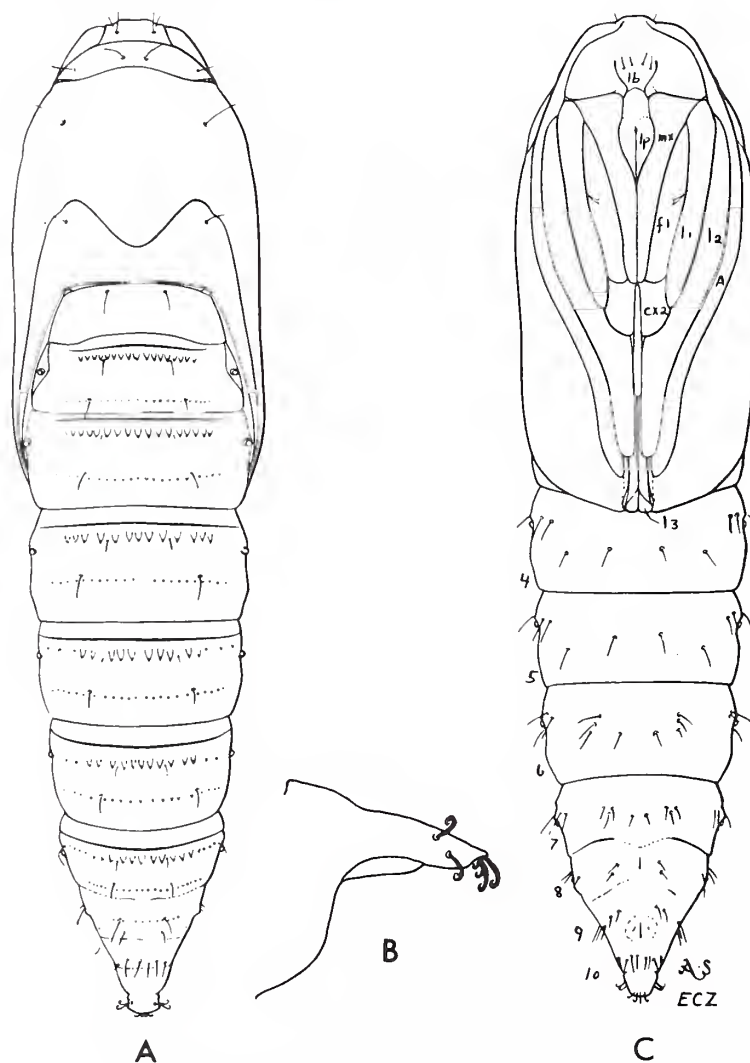


Epiphyas postvittana larva, lateral view (From Ferro 1976).

E. postvittana larvae are green, as in Amorbia emigratella, but prothorax does not have a black line on each lateral margin as does the larva of A. emigratella (Zimmerman 1978).

PUPAE (Fig. 7) - Newly formed, green; later, medium brown. Male averages 2.5 by 7.6 mm; female 2.9 by 9.8 mm (Danthanarayana 1975).

(Fig. 7)



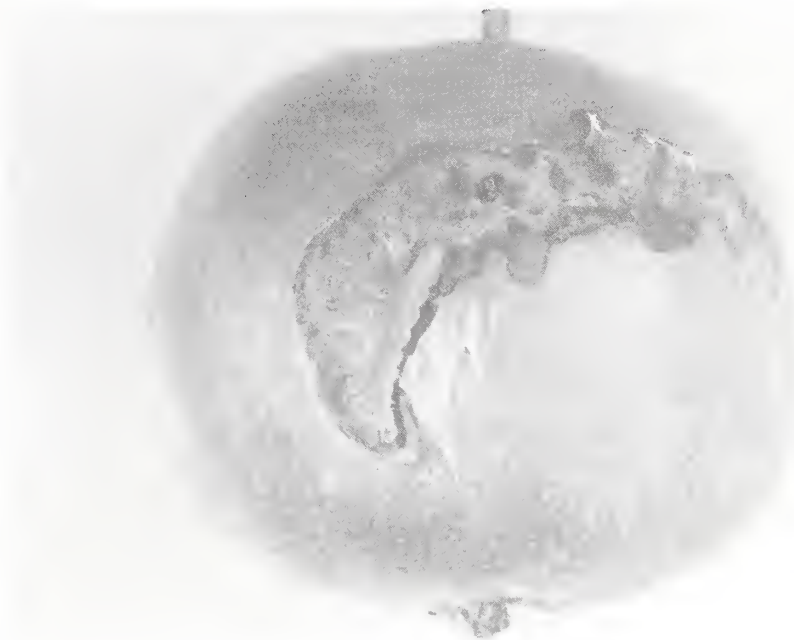
Epiphyas postvittana pupa. A. Dorsal view. B. Cauda, left lateral view. C. Ventral view.

cx2 - Mesocoxa; f1 - profemora; lb - labrum; lp - labial palpus; l1, l2, l3 - legs; mx - galea of maxilla (proboscis) (From Zimmerman 1978).

Characteristic
Damage

Larval feeding on fruit (Fig. 8) results in large irregular blemishes. These blemishes may callous over and the fruit remain on the tree, or wet conditions may allow the entry of rot organisms. Larvae may excavate small round pits and produce scars similar to the "stings" of the larvae of Cydia pomonella. Clusters of fruit are particularly susceptible. Larvae entering the fruit through the calyx may cause internal damage. Feeding on the foliage causes ragging and curling (Evans 1937, Ferro 1976, U.S. Department of Agriculture 1957).

(Fig. 8)



Epiphyas postvittana larva, dorsolateral view, showing damage to an apple (Geier and Briese 1981).

Detection
Notes

The movement of this pest from country to country may occur in one of several ways. Three possible pathways are as immatures with fresh fruit, immatures with propagative material, and as adults on aircraft. Although some of its hosts are prohibited because of other pests, many of its hosts are enterable into the United States subject to inspection under various regulations, mainly Title 7, Part 318.13, Part 319.37, and Part 319.56 of the Code of Federal Regulations.

The total number of E. postvittana interceptions at U.S. ports of entry was 63 in the past 13 years. Only larval and pupal stages have been intercepted. Interceptions were common on Malus sylvestris (apple) in cargo from Australia (13 times including 7 from Tasmania) and New Zealand (5). Cargo interceptions were made from Australia in Fragaria sp. (strawberry) and Pyrus communis (pear); and New Zealand in Capsicum spp. (peppers), Fragaria sp. (strawberry), Prunus spp. (cherries), P. armeniaca (apricot), P. domestica (plum), P. persica (peach), and Ribes nigrum (black currant). This pest has also been intercepted a few times in baggage and stores.

This species may be detected in the following ways.

1. Search for overlapping egg masses on leaves. The egg mass may be jet black if parasitized by Trichogramma sp. (a trichogrammatid wasp).
2. Inspect fruit for irregular brown areas, round pits, or scars. Look for evidence of feeding at the calyx end of the fruit. If no external signs of the larva are present, probe the calyx areas. If frass is discovered, cut out the calyx area below it and break the apple open. The larva will be found at the calyx end or in the endocarp.
3. Inspect for ragged and curled leaves. Open rolled up leaves to search for larvae.
4. Watch for adults resting on the underside of the leaves during the day.

Biology

In Tasmania, adults begin appearing in orchards during early summer. They lay their eggs on apple leaves. The newly hatched larvae feed principally on the underside of leaves in silken tunnels. After about 3 weeks, they abandon their tunnels and continue feeding. They pupate in folded or webbed leaves. In late summer, another generation of moths emerges. Larvae from this generation feed as long as leaves remain on trees. When the leaves fall, the larvae drop and feed on cover crops, but they can survive on the orchard floor without feeding as long as 2 months. The next spring, they return to the trees to feed on the green shoots and later in the blossom clusters (Evans 1937, U.S. Department of Agriculture 1957).

In Australia, adults rest under leaves during the day. If disturbed, they make short erratic flights. They become active at dusk and oviposit either late in the evening or during the night. Females of the first summer generation mate shortly after emergence and lay their eggs 2 or 3 days later. They usually lay 20-25 eggs each, in partly overlapping masses on smooth surfaces, mostly on the leaves of host plants. They normally produce 100-200 eggs in a lifetime of about 10 days. Fecundity depends on the season, and under field conditions, females may lay 209-455 eggs.

After 1-2 weeks, the larvae hatch. They disperse actively, either by crawling or by dropping on silken threads, before constructing a silken shelter, often on the underside of a leaf near the midrib or a vein. After the first moult, they construct typical leaf rolls (nests) by webbing one or more leaves together, or by webbing a leaf onto the surface of a fruit. During the fruiting season, they also make nests among clusters of fruits, and sometimes tunnel into the fruits through the calyx. If disturbed, young larvae tend to withdraw to the end of their tunnels, while older larvae will wriggle violently, and either drop to the ground or hang suspended by a silken thread. The larva passes through six instars, but its appearance remains generally similar throughout, except for increase in size. Very rarely under laboratory conditions, five or seven instars develop but never four. Pupation occurs within the nests (Danthanarayana 1975 and 1983, Evans 1937, Ferro 1976, Geier and Briesse 1981, U.S. Department of Agriculture 1957).

The longest mean life span in experiments was 33 days for females and 26 days for males at about 12° C. The shortest mean life span measured was 3 days at 31° C. The pest has no winter resting stage, being active throughout the year. Adult activity is, however, much slower during the winter. There are three generations a year in Australia. The favorable temperature range is between 15 and 25° C. A long, hot summer does not support Epiphyas populations; the pest prefers regions with cool climates (Danthanarayana 1975).

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